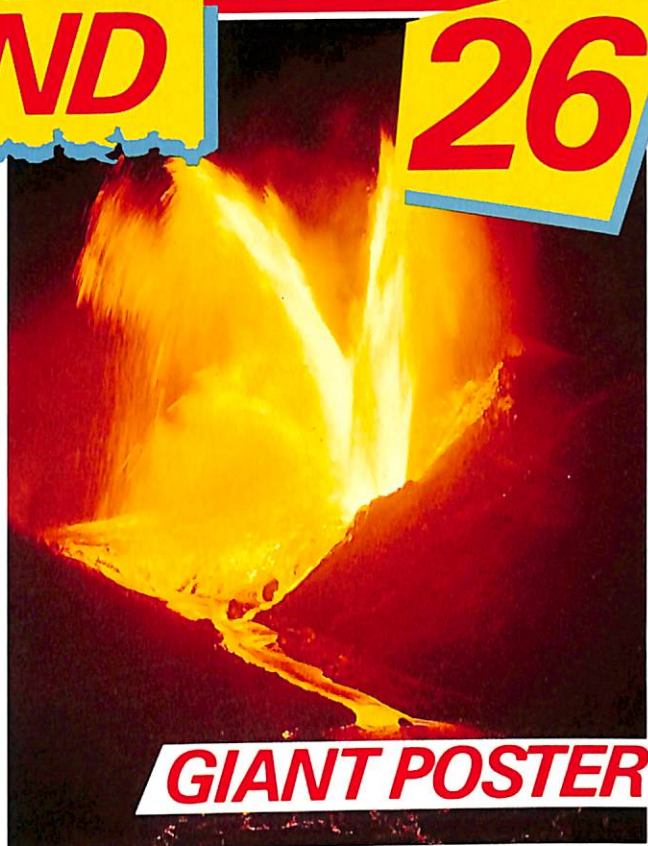


# QUEST

ADVENTURES IN THE WORLD OF SCIENCE

## UNDERGROUND

## 26



### GIANT POSTER

#### FACT FILES ON:

- ▶ The Earth's core
- ▶ Predicting earthquakes
- ▶ The San Andreas Fault
- ▶ Underworld life
- ▶ The king of metals
- ▶ Underground trains
- ▶ Mining machines

### MODEL: ERUPTING VOLCANO

### FIND LIFE IN THE SOIL

UK £1.99 IR£2.25 Aust \$4.95 NZ \$5.95 (inc. GST) Malaysia RM5.90 Sing \$5.95 Malta Lm1.75 S. Africa R8.95

FULLY  
SOR



# INSIDE THIS PACK

## FACT FILES

- ▶ Earthquakes ▶ Lava Flows ▶ Subterranean caverns ▶ Burrowing animals ▶ Nuclear bomb shelters ▶ Drilling for oil ▶ Blasting ore-bearing rock



**MODEL** Erupting volcano

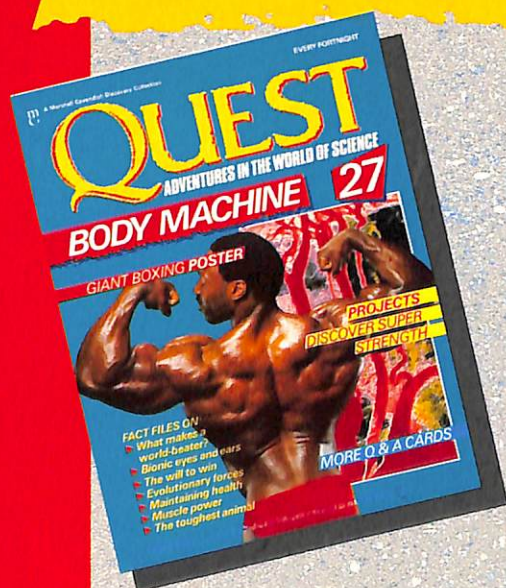


**POSTER**  
A London Underground station



**SCIENTIFIC PROJECTS**

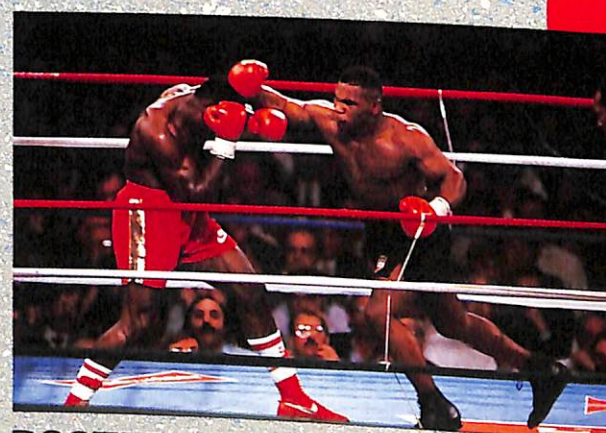
## COMING IN QUEST 27 BODY MACHINE



More Q & A cards

## FACT FILES INCLUDE:

- ▶ Supermen
- ▶ Artificial limbs
- ▶ Maintaining fitness
- ▶ Animal strength
- ▶ Stress: the killer
- ▶ Natural selection



**POSTER** Raw power in the ring

**PLUS** DataQuest update

ISSN 1350-3766







# PROJECTS UNDERGROUND

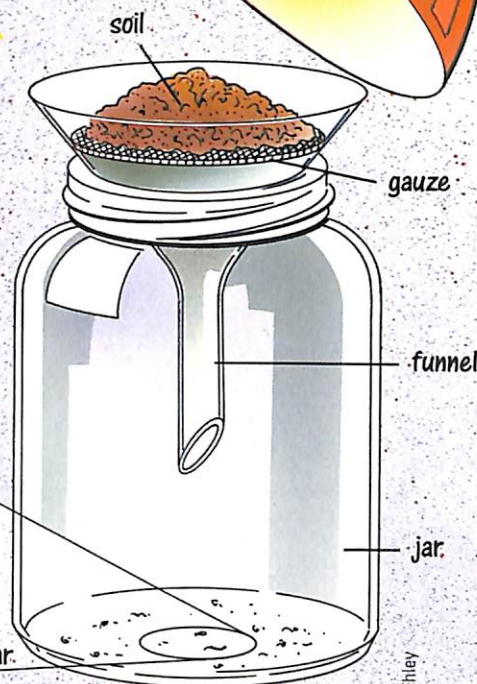
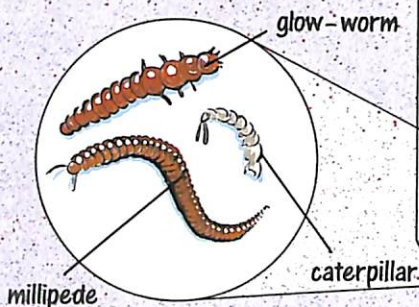
• Is there a simple experiment you can do to find out what different kinds of animals live under the earth's surface?

## ANIMALS IN THE EARTH



Many minute animals live beneath the earth's surface. Mostly they live there because they hate light.

Put a piece of gauze in a funnel and place some soil on it. Support the funnel in the mouth of a large, clean jar. Put the jar under a light and leave it there overnight. In the morning, all the creatures in the soil will be in the bottom of the jar. Tip them back into the soil and return them to the garden.



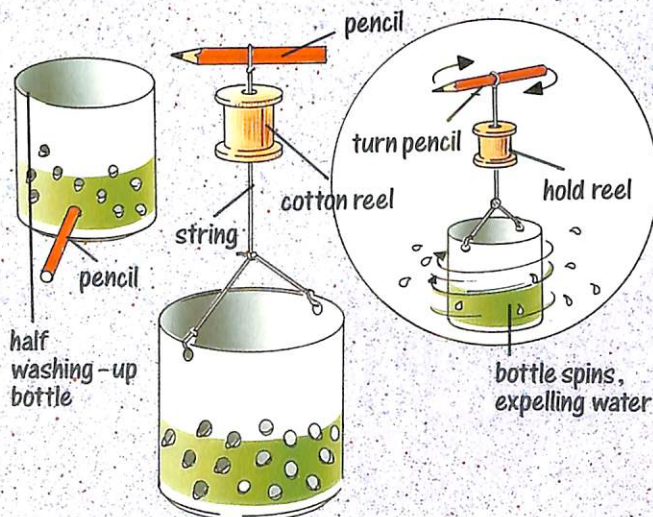
Simon Critchley

## ADVENTURES IN THE WORLD OF SCIENCE • ADVENTURES IN THE WORLD OF SCIENCE

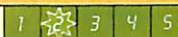
## A SPIN DRIER



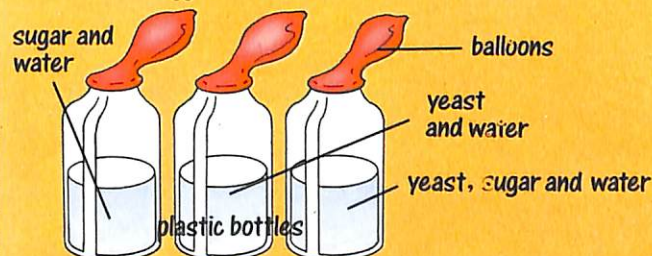
Cut a washing-up bottle in half and poke holes in it with a pair of scissors and then a pencil. Make a string handle as shown, thread a cotton reel onto it, and tie the loose end around a pencil. Place some wet cloth into the 'drum'. Hold the reel in one hand and rotate the pencil quickly with the other. The water will come out of the holes and the cloth should dry out.



## BALLOONS



You will need three bottles and balloons, some sugar, yeast, a teaspoon and water. In the 1st bottle put a teaspoon each of sugar and water. In the 2nd put a teaspoon each of yeast and water. In the 3rd put a teaspoon each of all three. Place the balloons over the necks of the bottles then put them in the fridge. After 2 hours see which balloon is the biggest.



## PROJECT INFORMATION

Each **QUEST** project has its own difficulty rating: 1 very simple, 2 simple, 3 intermediate, 4 advanced, 5 complicated.



## WARNING!

Every care has been taken to ensure projects are as safe as possible. However, parents should supervise all projects. The publisher can accept no liability for injury.





# MODEL

## ASSEMBLY INSTRUCTIONS

### You will need

Scissors • Ruler • Craft knife • Glue

Before cutting out the pieces, score along all broken lines with a blunt edge and ruler to make folding and gluing easier. Study the ASSEMBLY DIAGRAM to see how the pieces fit together, and use dotted lines as a guide for positioning.

**NB** Younger children will need supervision when using a craft knife.

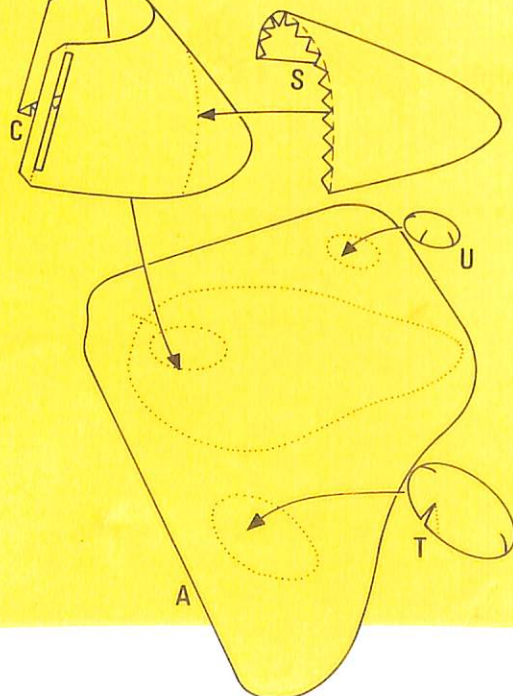
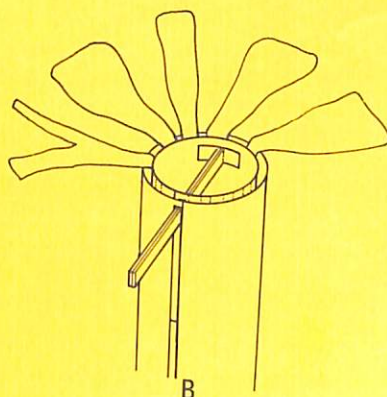
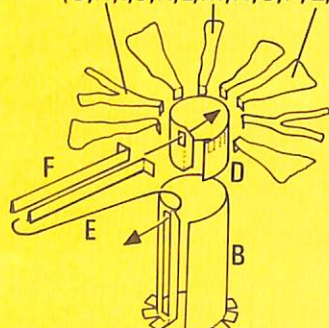
### To make up Volcanic island

1 Cut out model base **A**.

2 Cut out inner pipe of volcano **B**. Cut out slit in **B**. Cut small tabs and fold them outwards. Spread glue along large tab and glue **B** into tube shape. Glue small tabs of **B** on to circle of dots on the island **A** (see ASSEMBLY DIAGRAM).

**NB** Slit in **B** must be positioned opposite straight dotted line at right angle to edge of island.

(G,H,I,J,K,L,M,N,O,P,Q,R,)



# ERUPTING VOLCANO



3 Cut out volcano **C** and slit in **C**. Glue large tab and stick **C** into cone shape. Fold tabs inwards and glue to island.

**NB** Make sure slits **B** and **C** align with each other.

### Lava erupting from crater

1 Cut out **D**. Cut out slit in **D**. Glue **D** into tube.

2 Cut out **E** and fold along broken line. Glue two sides of fold together.

3 Repeat with **F**.

4 Place **F** against **E**, with both tabs at same ends. Glue **F** to **E**, but do not glue tabs together.

5 Thread lever **E/F** through slit in **D** and glue tabs to other side of **D**.

6 Cut out tongue of lava and ash **G**. Fold tab firmly. Bend crease backwards and forwards to make it flexible. Stick tab of **G** to first position (marked with dots) to left of slit on **D**. Ash side of **G** faces outwards, lava side inwards.

7 Repeat with **H, I, J, K, L, M, N, O, P, Q** and **R**.

8 Thread lever through slit in side of volcano, so that tube **D** fits inside crater.

### To finish main island

Cut out **S**. Fold all tabs under. Attach **S** to side of volcano and rest of main island on **A** by gluing tabs of **S** to **A**.

### Other islands

1 Cut out **T**. Cut along four fold lines and glue small folds in place. Fold tabs under and glue them to middle-sized island base. Hold island down until glue has dried.

2 Repeat with smallest island **U**.

### To make volcano erupt

Push the lever down to the bottom of the slit in the volcano and pull it up again. Flames, smoke and ash shoot into the air, and then lava flows down the side of the volcano!



# TRAVELLING UNDERGROUND

## RAILS BENEATH THE CITY

### PROFILE

#### BEATING THE TRAFFIC

Underground railways play a vital role in over 80 cities around the world, carrying passengers beneath the congestion and pollution of traffic-jammed streets. Usually the outer parts of the railway network are above ground, in the less crowded suburbs. At peak hours, an underground railway can carry as many as 40 trains per hour in one direction, representing 50,000 people – several times as many people as an eight-lane motorway. If New York city had no subway system, a quarter of Manhattan would have to be turned into a car park.

**Largest system:** London Underground (408 km)  
**Most passengers/years:** Moscow (2,581 million)  
Tokyo (2,154 million)  
Mexico City (1,444 million)  
**Most train carriages:** New York City Transit Authority (6,273)  
**Most stations:** NYCTA (463)  
Paris Metro (367)  
London Underground (273)  
**Typical energy use/passenger-km:** 0.5  
kilowatt-hr (compared with: bus 0.2; car 0.9).  
*(Some cities have several underground railways. In these cases the figures refer to the largest system.)*

#### TUNNEL POWER

London has the oldest and most extensive underground railway in the world. Of its 408 km of track, 40 per cent of the total lies underground. The first of its tunnels were built by 'cut and cover' methods – a trench was dug along the streets and then roofed over. But later tunnels were bored through the earth and lined with cast-iron (later concrete) tubing with an internal diameter of 3.85 metres. The deepest point in the system, near Hampstead station in north-west London, is 67.36 metres below ground. The system's longest tunnel is 27.8 km long.

For 20 years some of London's underground trains have been almost completely automatic – when the driver presses a button, the train closes its doors, accelerates, cruises and comes to a stop at the next station without any further intervention. It is guided by sig-

nals transmitted through the power rail. In some other cities, including Vancouver in Canada and Lille in France, the trains are entirely unmanned.

All underground trains are now powered by electricity (the first ones had steam locos). Most take their power through a third rail, but some use an overhead power line. London Underground is unusual in that it operates two generating stations of its own, delivering 298 megawatts – enough power to supply a small city.

Some energy is saved in underground systems by positioning stations on 'humps' wherever possible. The train runs down a slope as it leaves a station, helping it to build up speed; it is then helped to slow by a gentle upward slope to the next station.

On a few systems, such as the Paris Metro, trains use rubber-tired wheels instead of the usual 'steel on steel'. The aim is a smoother and quieter ride.







Main picture: courtesy of London Transport Museum

## HEART OF THE CITY

Beneath the centre of London lies Piccadilly Circus, one of London Underground's busiest stations. The twin tracks of the Bakerloo line were the first to be built, at a depth of 26.2 metres. Later the Piccadilly line was built at 31 metres. To save costly land, only the entrances are at street level – the booking office, shops and a spacious concourse are underground. Electronic ticket machines scrutinize tickets of travellers on their way to and from the trains. Banks of escalators link the concourse to the platforms. An escalator can carry up to 10,000 people per hour – at Piccadilly Circus they have to handle over 31 million passengers per year.



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